

REMARKS

Claims 1-7, 9-12, 14-23, 25-28, 30-41, 43-46, and 48-50 are pending in the present application. Claims 1, 2, 5-7, 9-11, 17, 18, 21-23, 25-27, 33-36, 39-41, and 43-45 were amended. Claims 8, 13, 24, 29, 42, and 47 were canceled. Reconsideration of the claims is respectfully requested.

Amendments were made to the specification to correct errors and to clarify the specification. No new matter has been added by any of the amendments to the specification.

I. Telephone Interview with Examiner Manoskey on 12-13-04

Applicant thanks Examiner Manoskey for the courtesy extended to Applicant's representative during the December 13, 2004 telephone interview. During the telephone interview, the Examiner and Applicant's representative discussed amending the independent claims to further distinguish the present invention from the cited reference. Examiner Manoskey appeared to indicate that the amended claim language would overcome the prior art reference if it contained language limiting Applicant's current invention to a single node. Therefore, it is Applicant's representative's understanding that barring additional materially relevant prior art being found in an updated search by Examiner Manoskey, the present claims are now in condition for allowance. The substance of the interview is summarized in the remarks of Section III, which follows below.

II. 35 U.S.C. § 101, Non-Statutory Subject Matter, Claims 43-50

The examiner has rejected claims 43-50 under 35 U.S.C. § 101 as being directed towards non-statutory subject matter. This rejection is respectfully traversed.

With regard to claims 43-50, the Examiner stated:

Claims 43-50 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The computer program product of claims 53-50 is considered to be a program per se is no-statutory subject matter. The examiner suggests to the

Applicant to include the limitation "**in a computer-readable medium**" in a similar manner as in claims 35-42. (Emphasis added).

(Office Action, dated September 22, 2004, Page 2).

Amended independent claim 43 of the present invention, reads as follows:

43. A computer program product in a **computer-readable medium** for inserting an additional process within a plurality of processes containing a mutually monitoring process policy in a data processing system, comprising:

instructions for establishing a monitoring policy, wherein the monitoring policy assigns each process within the plurality of processes to monitor one other process within the plurality of processes, thereby forming a ring of mutually monitoring processes within the data processing system;

instructions for receiving a request for an additional process to join the plurality of processes;

instructions, responsive to the additional process joining the plurality of processes, for randomly selecting a process within the plurality of processes to monitor the additional process; and

instructions for modifying the mutually monitoring process policy, wherein the selected process monitors the additional process for termination of execution. (Emphasis added).

Independent claim 43 has been amended according to the Examiner's recommendation. Claims 44-50 are dependent upon amended independent claim 43. Therefore, Applicant respectfully submits that claims 43-50 now recite statutory subject matter. Accordingly, Applicant respectfully urges that the rejection of claims 43-50 under 35 U.S.C. § 101 be withdrawn.

III. 35 U.S.C. § 102, Anticipation, Claims 1-50

The examiner has rejected claims 1-50 under 35 U.S.C. § 102 as being anticipated by *Huang* (U.S. Patent No. 5,748,882). This rejection is respectfully traversed.

A prior art reference anticipates the claimed invention under 35 U.S.C. § 102 only if every element of a claimed invention is identically shown in that single reference, arranged as they are in the claims. (*In re Bond*, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990)). All limitations of the claimed invention must be considered when determining patentability. (*In re Lowry*, 32 F.3d 1579, 1582, 32 U.S.P.Q.2d 1031, 1034

(Fed. Cir. 1994)). Anticipation focuses on whether a claim reads on the product or process a prior art reference discloses, not on what the reference broadly teaches. (*Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983)).

A. Amended independent claim 1 of the present invention, which is representative of amended independent claims 17, 33, and 35, reads as follows:

1. A method of mutual process monitoring for detecting a termination of a process within a plurality of processes in a data processing system, the method comprising the steps of:
 - establishing a monitoring policy, wherein the monitoring policy assigns each process within the plurality of processes to monitor one other process within the plurality of processes, thereby forming a ring of mutually monitoring processes within the data processing system, wherein the data processing system is a single node within a multi-node system;
 - responsive to a termination of execution of a monitored process, determining the cause of the execution termination by the monitoring process; and
 - responsive to a determination that the monitored process terminated execution in an abnormal manner, attempting to restart the monitored process by the monitoring process.

With regard to independent claim 1, the Examiner stated:

Referring to claim 1, Huang teaches a method for observing whether a process is unable to continue, this is interpreted as detecting a termination of a process within a plurality of processes in a data processing system (See Col. 2, lines 18-23). Huang also teaches the use of a daemon that monitors the process, this is interpreted as establishing, within the plurality of processes, a monitoring policy, wherein the monitoring policy assigns a first process within the plurality of processes to monitor a second process within the plurality of processes (See Col. 4, lines 5-9). Huang discloses observing the process and determining if it is unable to continue, this is interpreted as determining the cause of the execution termination (See Col. 2, lines 18-23). Finally Huang teaches restarting the process, this is interpreted as responsive to a determination that the second process terminated execution in an abnormal manner, attempting to restart the second process by the first process (See Col. 3, lines 61-62).

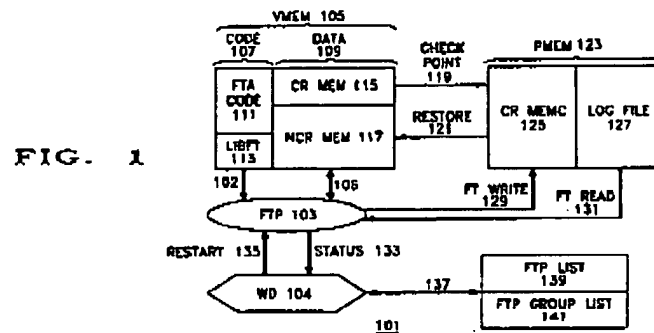
(Office Action, dated September 22, 2004, Page 3).

Huang teaches a method for fault-tolerant computing by employing a monitor daemon which is implemented as one or more user processes. A user process which is executing on ordinary hardware under an ordinary operating system is made fault-

tolerant by **registering** it with the monitor daemon. The monitor daemon monitors fault-tolerant processes, and when such a process hangs or crashes, the daemon restarts it.

(Emphasis added) (*Huang*, Abstract).

In other words, *Huang* teaches that all of the fault-tolerant processes within a data processing system have to be **registered centrally** with the monitor or watch daemon in order to utilize this method. (*Huang*, Figure 1).



As *Huang*'s Figure 1 clearly depicts above, in a single node system all fault-tolerant processes (FTP 103) are directly connected to the monitor or watch daemon (WD 104). Thus, the fault-tolerant processes in *Huang* cannot form a ring configuration amongst themselves within a single node.

In contrast, Applicant's present invention recites in claim 1 a method of **mutual process monitoring** for detecting a termination of a process within a plurality of processes in a single node system. The method recited in claim 1 of Applicant's current invention establishes a monitoring policy whereby each process within the plurality of processes is assigned to monitor one other process within the plurality of processes, thereby **forming a ring of mutually monitoring processes within a single node**. In other words, each process, according to the monitoring policy, will monitor one other process in the ring as recited in claim 1.

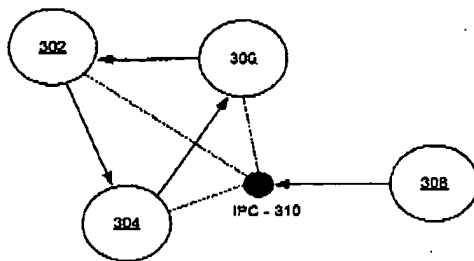


Figure 3A

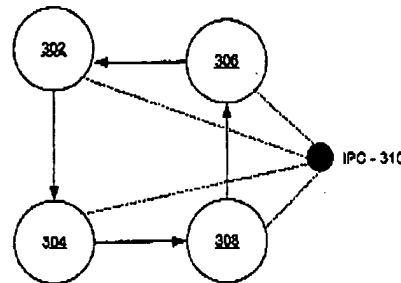


Figure 3B

(Application, Figures 3A and 3B).

For example, as is depicted in Figures 3A and 3B of Applicant's present invention above, there is **no single monitor process** as recited in claim 1. Numbers 302-308 above represent individual fault-tolerant processes that form a mutually monitoring process ring within a single node. Figure 3B demonstrates that process 302 monitors process 304, process 304 monitors process 308, process 308 monitors process 306, and process 306 monitors process 302, thus completing the mutually monitoring process ring. Applicant's current invention does not require that each fault-tolerant process register centrally with a monitor or watch daemon as taught in the method of *Huang*.

Accordingly, *Huang* does not identically teach each element of Applicant's present invention as recited in amended independent claims 1, 17, 33, and 35.

B. Amended independent claim 9 of the present invention, which is representative of amended independent claims 25, 34, and 43, reads as follows:

9. A method for inserting an additional process within a plurality of processes containing a mutually monitoring process policy in a data processing system, the method comprising the steps of:
 - establishing a monitoring policy, wherein the monitoring policy assigns each process within the plurality of processes to monitor one other process within the plurality of processes, thereby forming a ring of mutually monitoring processes within the data processing system, wherein the data processing system is a single node within a multi-node system;
 - receiving a request for an additional process to join the plurality of processes;
 - responsive to the additional process joining the plurality of processes, randomly selecting a process within the plurality of processes to monitor the additional process; and

modifying the mutually monitoring process policy, wherein the selected process monitors the additional process for termination of execution.

With regard to claim 9, the Examiner stated:

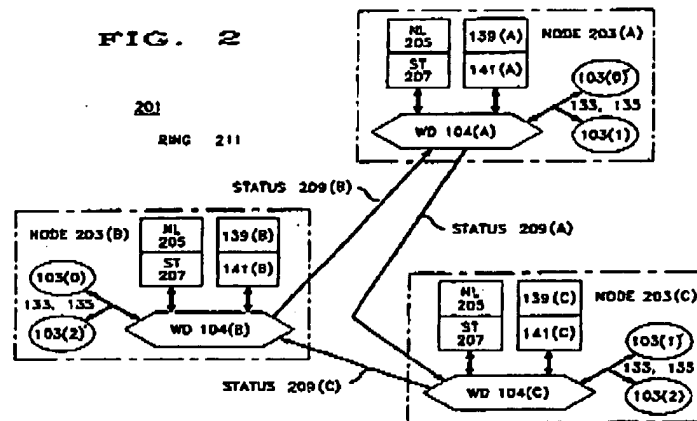
Referring to claim 9, Huang teaches a method for observing whether a process is unable to continue and the watch daemon that can start the process, this is interpreted a process within a plurality of processes containing a first process and a monitoring policy in data processing system (See Col. 2, lines 18-23 and Col. 5, lines 50-52). The watch daemon can start a process at any time, this is interpreted as a second process requesting to the join the plurality of processes (See Col. 5, lines 50-52). Huang discloses the daemons forming an adaptive ring, this is interpreted as responsive to the second process joining the plurality of processes, selecting the first process to monitor the second process (See Col. 5, lines 8-11). Huang discloses observing the process and determining if it is unable to continue, this is interpreted as monitoring the second process for termination of execution (See Col. 2, lines 18-23).

(Office Action, page 5).

As previously stated in Section A above, *Huang* teaches that all of the fault-tolerant processes within a single node have to be registered centrally with the monitor or watch daemon in order for the method to perform properly. (See *Huang*, Figure 1 in Section A above). In contrast, Applicant's present invention recites in claim 9 a method for each process within a plurality of processes to monitor one other process within the plurality of processes, thereby forming a ring of mutually monitoring processes within a single node. The same arguments for amended independent claim 1 in Section A above are applicable to amended independent claim 9. Hence, the Section A arguments are herein applied. Therefore, *Huang* does not teach this recited feature of Applicant's claim 9.

But, Examiner Manoskey cites in the Office Action *Huang*, Column 5, lines 8-11, with regard to claim 9. That passage states that, "...the relationship between watching daemon and the node which it watches is such that the nodes in the system form an adaptive ring for fault diagnosis." (*Huang*, Column 5, lines 8-11). In other words, when the method of *Huang* is employed in a multi-node system, the monitor or watch daemon

on each node monitors one other node in addition to the processes in its own node.
(Huang, Abstract).



(Huang, Figure 2).

As is depicted in Figure 2 above, *Huang* teaches an adaptive ring formed in a multi-node system (Node 203 (A)-(C)) by connecting the monitor or watch daemons (104 (A)-(C)) from each of the separate nodes. Consequently, *Huang* does not teach that the adaptive ring is formed in a single node system, nor does *Huang* mention the desirability of such a feature.

However, claim 9 of the present invention recites a method to establish a monitoring policy whereby each process within the plurality of processes is assigned to monitor one other process within the plurality of processes, thereby forming a ring of mutually monitoring processes within a single node. Hence, claim 9 recites a method for monitoring processes by having the processes themselves form a mutually monitoring ring within a single node. In view of the foregoing, *Huang's* adaptive ring formed by the monitor or watch daemons **within a multi-node system** is distinguishable from the ring of mutually monitoring processes **within a single node** as recited in claim 9 of Applicant's current invention.

In addition, Examiner Manoskey stated: "The watch daemon can start a process at any time, this is interpreted as a second process requesting to join the plurality of processes (See Col. 5, lines 50-52)." *Huang* states in column 5, lines 50-52 that, "...each

watch daemon sends a message when it starts or restarts a process to all the other daemons....” Even though *Huang* teaches that the monitor or watch daemon can insert an additional process to the plurality of processes within a multi-node system, it does not teach the method of inserting an additional process to the plurality of processes in a single node by **randomly selecting a process** within the plurality of processes to monitor the additional process as recited in claim 9 of the current invention.

As stated above, *Huang* teaches that all of the fault-tolerant processes within a single node **have to be registered** with the monitor or watch daemon. This is in contrast to Applicant’s present invention recited in claim 9 which randomly selects a process within the plurality of processes in a single node to monitor the additional process and modifies the mutually monitoring process policy accordingly to accommodate the additional process into the ring of mutually monitoring processes. Therefore, Applicant’s current invention does not recite a single monitor or watch process as is taught in *Huang*. As a result, *Huang* does not identically teach each element of recited amended independent claims 9, 25, 34, and 43 of the present invention.

C. In view of the arguments contained in Sections A and B above, Applicant respectfully submits that each and every element of amended independent claims 1, 9, 17, 25, 33, 34, 35, and 43 are not identically taught by *Huang*. Claims 2-7, 10-16, 18-23, 26-32, 36-41, and 44-50 are dependent claims depending on independent claims 1, 9, 17, 25, 33, 34, 35, and 43 respectively. Applicant has already demonstrated claims 1, 9, 17, 25, 33, 34, 35, and 43 to be in condition for allowance. Applicant respectfully submits that claims 2-7, 10-16, 18-23, 26-32, 36-41, and 44-50 are also allowable, at least by virtue of their dependence on allowable claims.

Furthermore, dependent claims 7, 10, 23, 26, 41, and 44 contain features not taught by the *Huang* reference.

D. Amended dependent method claim 7 of the present invention, which is representative of amended dependent apparatus claim 23 and amended dependent computer program product claim 41, reads as follows:

7. The method as recited in claim 1, further comprising:
responsive to a determination that the monitored process terminated execution in a normal manner, modifying the monitoring policy, wherein the monitoring policy is modified to assign the monitoring process to monitor a different process within the plurality of processes;
and
monitoring of the different process by the monitoring process for termination of execution.

With regard to claim 7, the Examiner stated:

Referring to claim 7, Huang discloses the daemons forming an adaptive ring, this interpreted as when the second process is determined to terminate in a normal manner having the first process monitor a third process (See Col. 5, lines 8-11). Huang discloses observing the process and determining if it is unable to continue, this is interpreted as monitoring the third process for termination of execution (See Col. 2, lines 18-23).

(Office Action, Page 5).

As argued in Section B above, *Huang's* adaptive ring formed by the monitor or watch daemons within a multi-node system is not analogous to the ring of mutually monitoring processes within a single node as recited in claim 9 of Applicant's current invention. That feature recited in independent claim 9 is also recited in independent claim 1, which claim 7 is dependent upon. Thus, claim 7 contains this feature by incorporation.

Since *Huang* does not teach the ring of mutually monitoring processes within the plurality of processes as recited in claim 1, then *Huang* cannot teach that the monitoring policy is modified whereby the monitoring process of the terminated monitored process is assigned to monitor a different process within the plurality of processes as recited in claim 7 of the present invention. In other words, the present invention recites in claim 7 that when a monitored process in a ring of mutually monitored processes terminates normally, then the ring is reconfigured according to the monitoring policy. Consequently, the process that previously monitored the normally terminated process is

assigned to monitor a different process within the plurality of process thereby reforming the mutually monitoring process ring.

As previously stated, *Huang* teaches that all of the fault-tolerant processes within a single node have to be registered with the monitor or watch daemon. Thus, *Huang* cannot form a ring of mutually monitoring processes within the plurality of processes in a single node as recited in claim 1. As a result, *Huang* cannot teach that the monitoring policy is modified to assign the monitoring process to monitor a different process within the plurality of processes thereby reforming the mutually monitoring process ring as recited in claim 7 of the present invention. Therefore, claim 7 of the current invention contains a feature not taught in *Huang*.

Moreover, in *Huang*'s single node system, if a fault occurs in the monitor daemon and is unable to execute its fault-tolerant function for the registered processes, then that node's fault-tolerance fails. However, as discussed above, in Applicant's present invention if a fault occurs in the monitoring process, fault-tolerance will continue within the single node because the mutually monitoring process ring will be reconfigured according to the monitoring policy

E. Amended dependent method claim 10 of the present invention, which is representative of amended dependent apparatus claim 26 and amended dependent computer program product claim 44, reads as follows:

10. The method as recited in claim 9, wherein the additional process monitors the process previously monitored by the selected process. With regard to claim 10, the Examiner stated:

Referring to claim 10, *Huang* discloses the daemons forming an adaptive ring, this is interpreted as the second process monitoring the process previously monitored by the first process (See Col. 5, lines 8-11).

(Office Action, Page 6).

As argued in Section B above, *Huang*'s adaptive ring formed by the monitor or watch daemons within a multi-node system is distinguishable from the ring of mutually monitoring processes within a single node as recited in independent claim 9 of Applicant's current invention. The same arguments in

Section B above are applied herein. As a result, since *Huang* does not teach the ring of mutually monitoring processes within a single node as recited in claim 9, then *Huang* cannot teach that the additional process monitors the process previously monitored by the selected process to reform the mutually monitoring process ring as recited in claim 10 of the present invention. Therefore, claim 10 of the Applicant's current invention contains a feature not taught in *Huang*.

Accordingly, in view of the arguments contained in Sections A-E above, Applicant respectfully urges that the rejection of claims 1-50 under 35 U.S.C. § 102 be withdrawn.

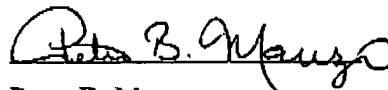
IV. Conclusion

It is respectfully urged that the subject application is patentable over the cited reference and is now in condition for allowance.

The examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

DATE: 12-15-04

Respectfully submitted,



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